



Climate Change and Cape Cod: Coastal Impacts and Adaptation Strategies

Adapting to Climate Change: Planning Approaches and Resources

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West Yarmouth, MA
December 4, 2007



Plan

1. Define Adaptation and why it is important to consider
2. Ideas on where and how to incorporate climate change info into planning
3. Available tools and various Adaptation Plans
4. Developing tools and an Adaptation Network/
Heinz Center Pilot project



Part 1

Define Adaptation and why it is important to consider

Where and how to incorporate climate change info into long-term planning

Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/ Heinz Center Pilot project



Adaptation: Notes

- Adjustments to reduce vulnerability: increase resilience/ better planning
- Mitigation: reduce emissions of GHG
- Adaptive capacity uneven w/in and across society: resources (poor communities/money, expertise, appropriate use of knowledge), political will, policies/regulations, not automatically translate into reduced vulnerability (e.g. New Orleans)
- Rarely *only* because of climate change: multiple stressors; hazard management
- Location and issue specific: locations vary so issues will vary
- Scale of information needs to match scale of issue

New York-New England

Annual Precipitation
Regional Weighted Change
+3.7% (1895-1999)

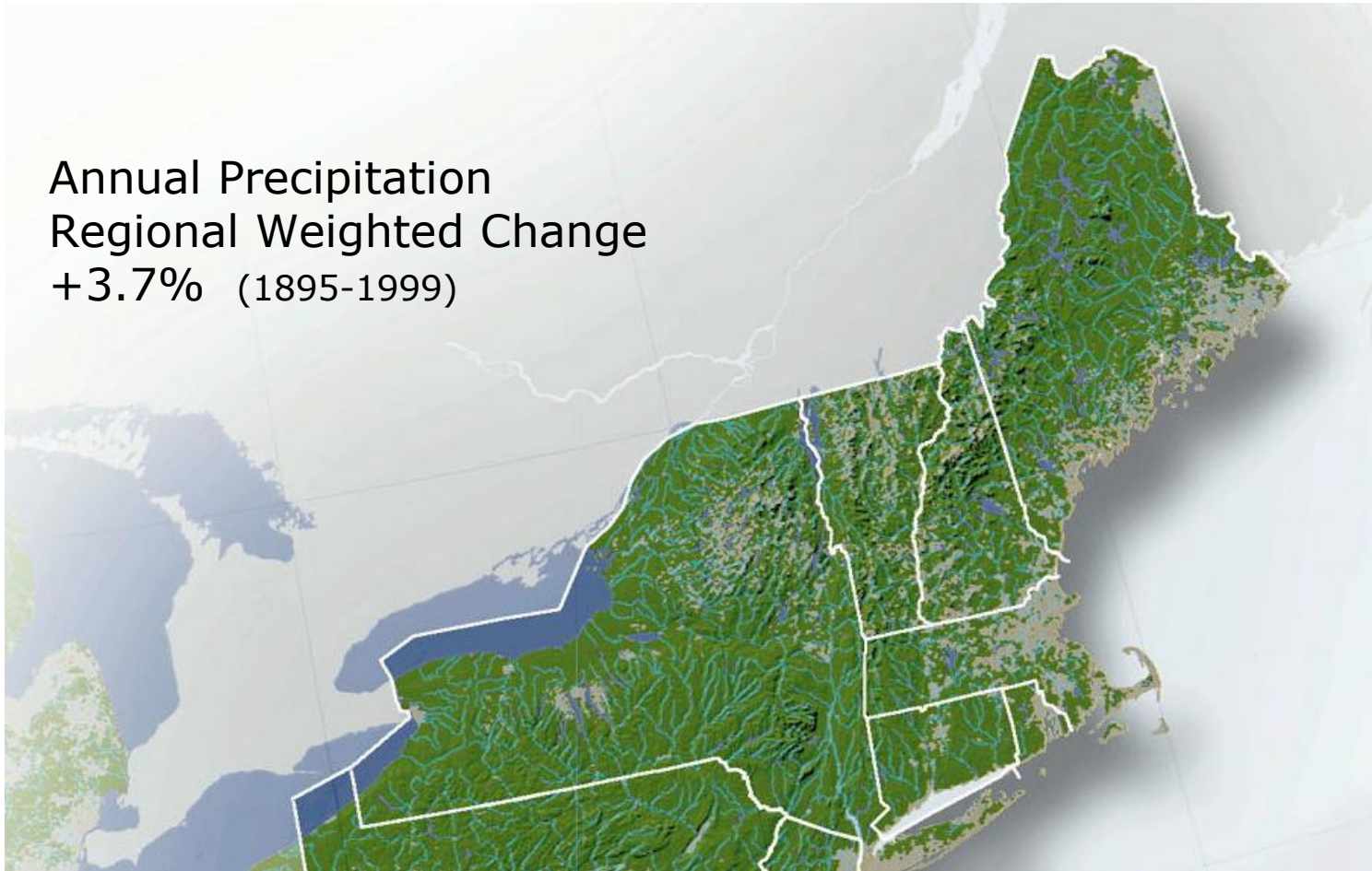


Figure: US National Assessment Overview pg 40

Scale matters: region size and info

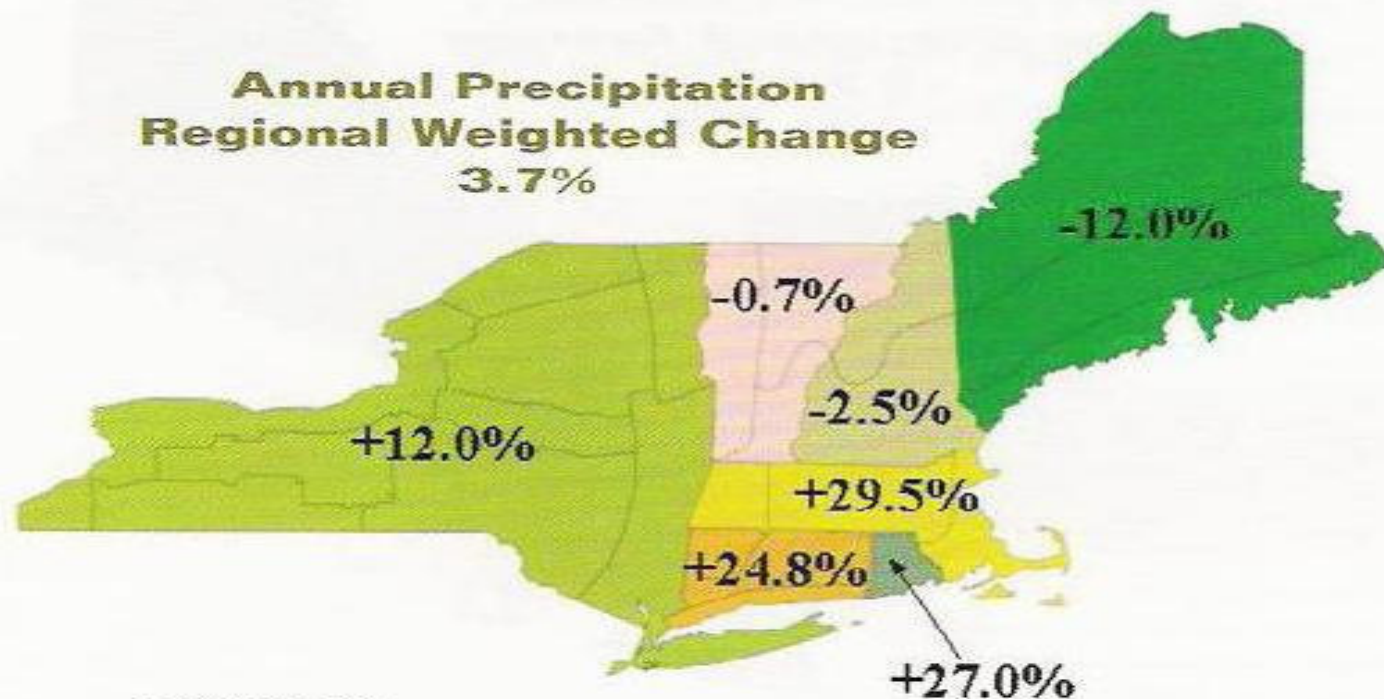


FIGURE 2.6

New England and New York annual precipitation changes (%) between 1895 and 1999. The faint lines within each state represent NCDC climate zones.

Source: New England Regional Assessment



Why is Adaptation important?

- **The future will be different than the past**
Infrastructure and natural resource management of past will be wrong; tolerances of design and species will be exceeded.
- **We are already committed to more change**
Greenhouse gasses have long lifetimes.
- **It is more than the averages . . .**
Regional/ local variability; extremes; seasonal
- **Amount of warming makes a difference**
Mitigation is critical but it is a slow process



Part 2

Define Adaptation and why it is important to consider
Ideas on where and how to incorporate climate
change info into planning (what can one town do?)

Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/ Heinz
Center Pilot project

Context

Climate Change
not the only challenge
to be juggled





Competition for Resources and Attention

Elderly: pensions, social security, health care

Economy: globalization; diminishing personal resources

Energy: more vulnerable, more costly

Environment: other issues of pollution and land/ water conservation



Towns have:

A lot to lose from climate impacts: sea-level rise, storms, water problems, potential health impacts, forest fires, etc.

Limited resources and tight budgets

Much to gain from opportunities: economic development, energy savings, avoided costs

Relevant authorities: building and development permits (influence land use); building codes; public transit

Opportunity to learn from and work with other communities

Can be leaders and call for support and leadership from the State

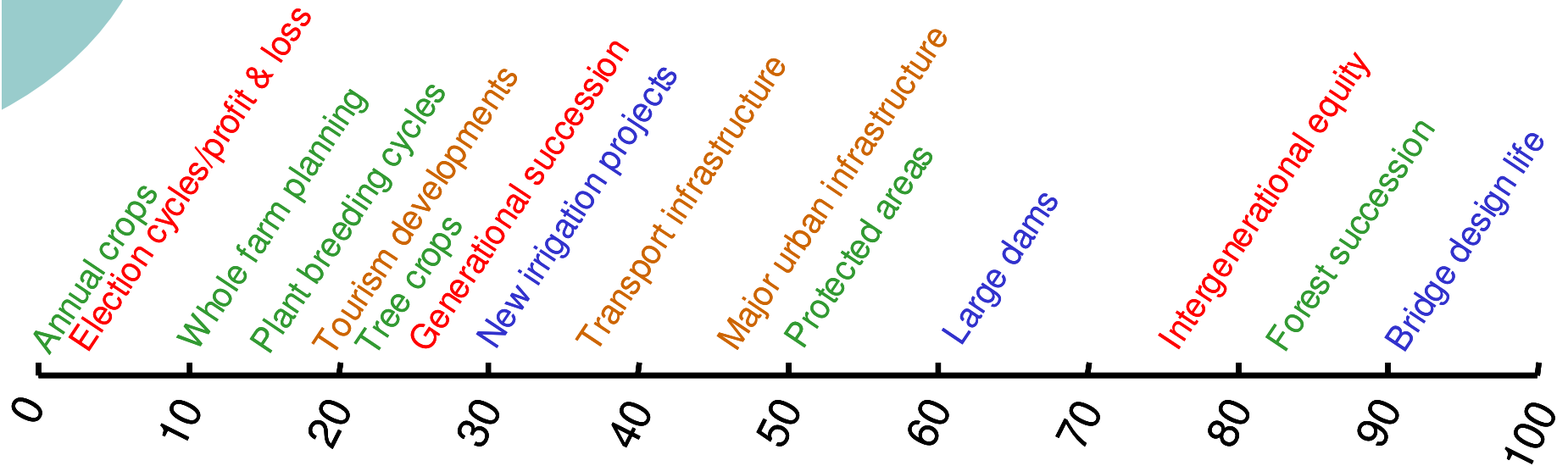


Guilford's Climate Change Resolution


February 5, 2007

The Board of Selectman resolves
that the Gov't of the Town of Guilford recognize
Climate Change as a phenomenon requiring long
term governmental monitoring and mgt . . .
Directs town depts and recommends Boards and
Commissions *formally consider the impacts . . .*
on planning, management, procurement and
budgetary decisions and regulations
re: greenhouse gas emissions and negative
impacts . . .

Adaptation planning: many timeframes



Timeline source: Linda Mearns, NRC, Oct 25, 2007



Adaptation options include: management, technology, institutions, monitoring, R & D

- Prioritize lands to preserve
- Design of migration corridors
- Emergency response plans
- Early warning alert systems / surveillance
- Infrastructure to withstand new “extremes”
- Linking of reservoirs to enhance supply
- Seed banks, mass propagation techniques
- Incentives / disincentives / insurance

Source: R. Bierbaum, Coping with Climate Change: National Summit, May 8-10, 2007



Adaptation Considerations

- What are the costs? Who pays?
- Unintended and unexpected consequences
- Relationships of adaptations in different sectors
- Relationship between adaptation and mitigation
- Who:
individuals, municipalities, states, regions, nations



Ways to Think About Options

Trends: from models and observations

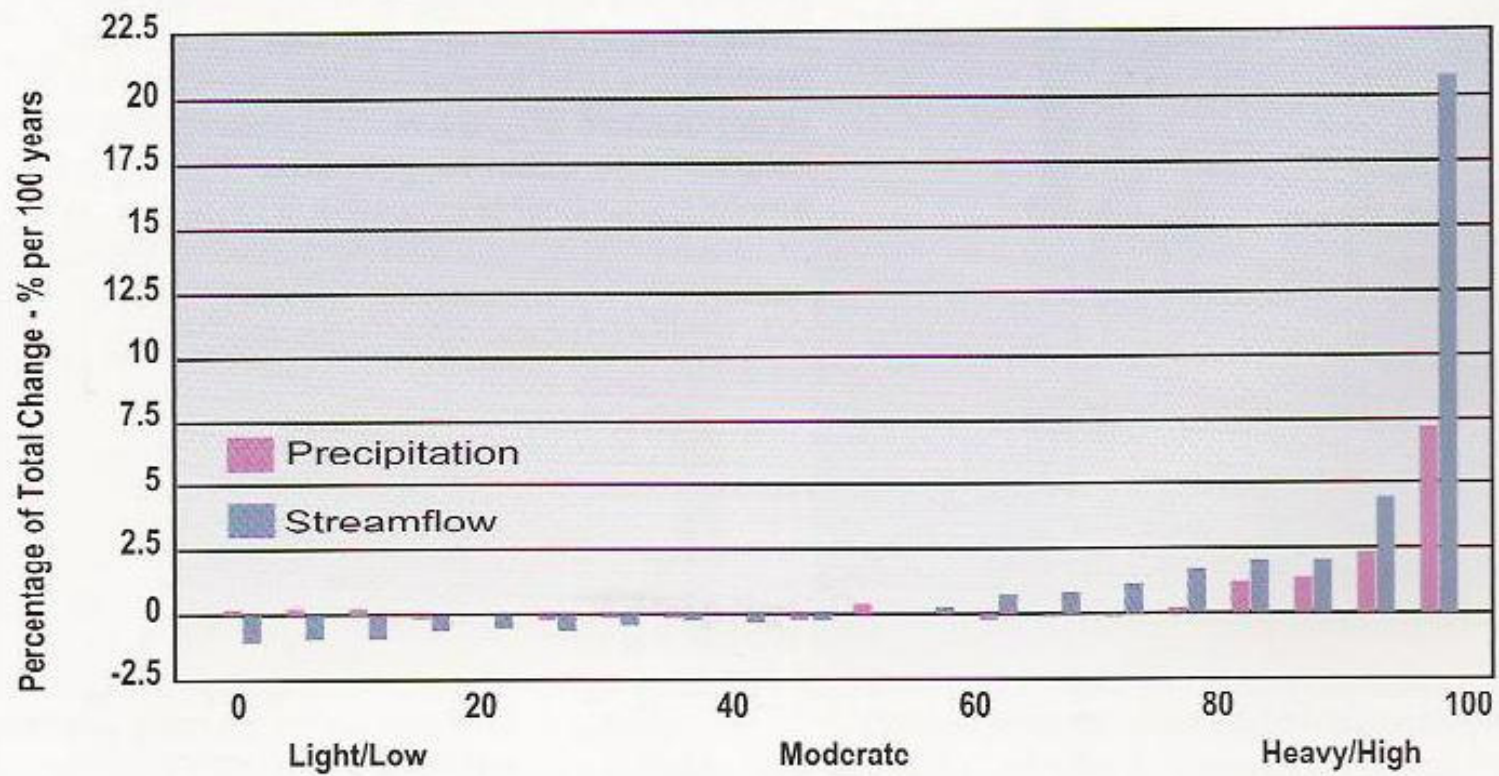
Vulnerability assessment

Scenario building

Hazard planning

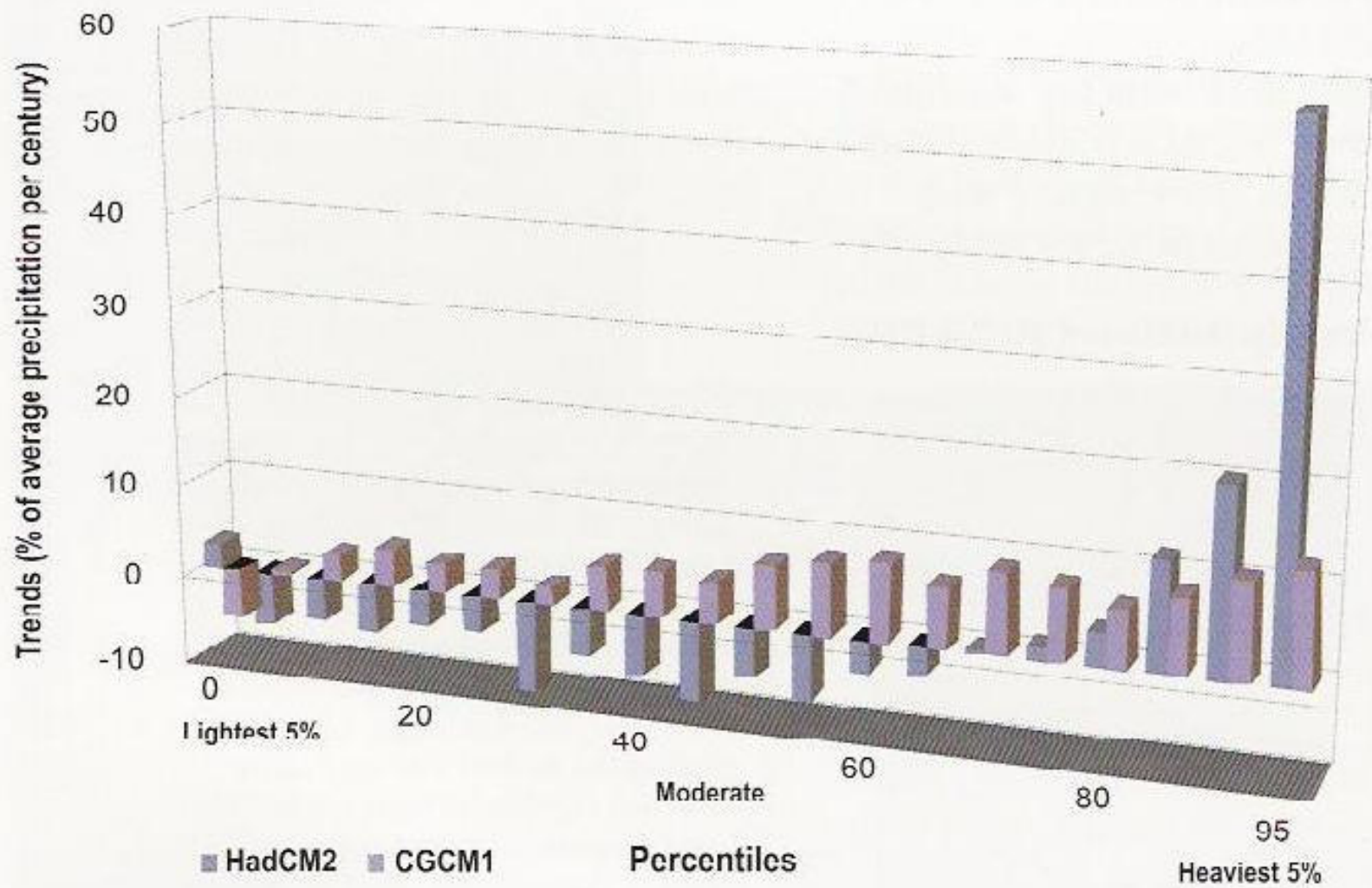
What ifs/how much

Observed Changes In Streamflow and Precipitation (1939-99)



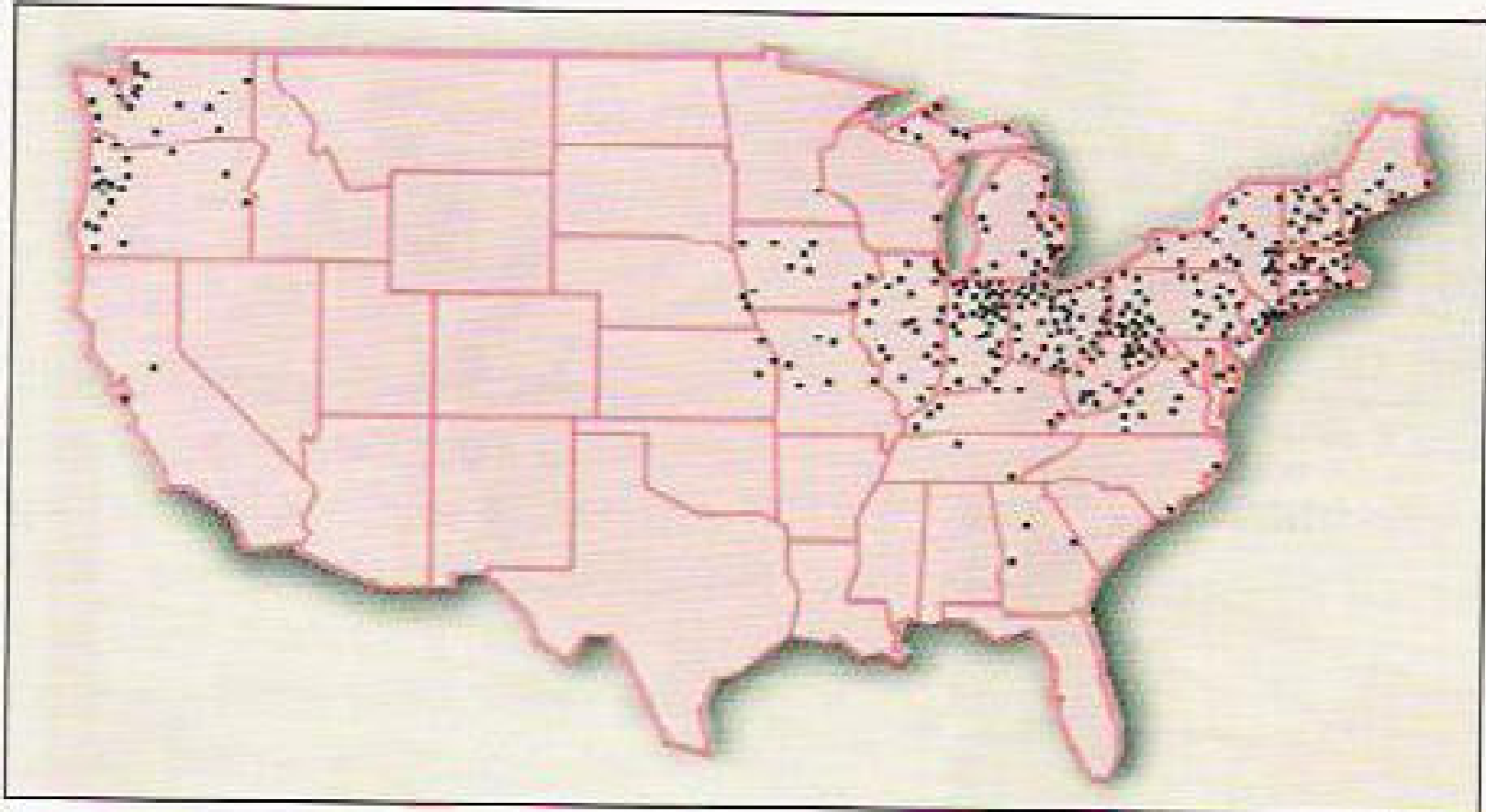
From US National Assessment

Projected 21st Century Change in US Daily Precipitation



Source: US National Assessment Overview Document

Combined Wastewater Systems



Source: US National Assessment Overview Document



Rhode Island/ CSO

- Overflowed: .5" rain-> raw sewage to Bay contaminated shellfish and beaches
- Adaptive Action:
 - Digging 3 massive tunnels: 170-280 ft
 - \$467 million/20 years
- Should contain 98% of waste water



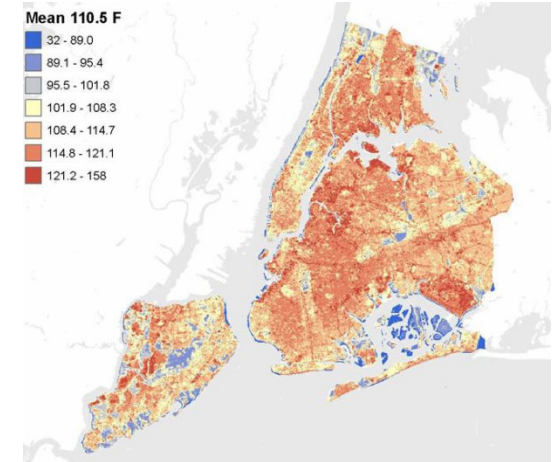
Part 3

Define Adaptation and why it is important to consider

Ideas on where and how to incorporate climate change info into planning

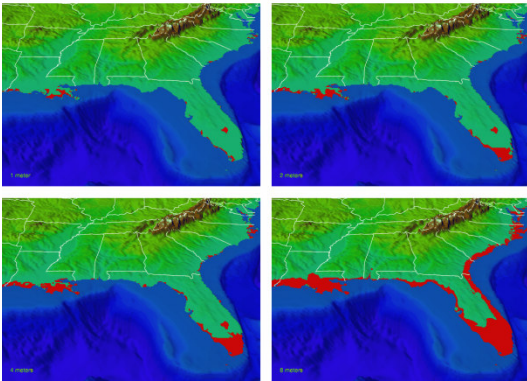
Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/ Heinz Center Pilot project



A Survey of Climate Change Adaptation Planning

Sea Level Rise



Bill Perkins
Dennis Ojima



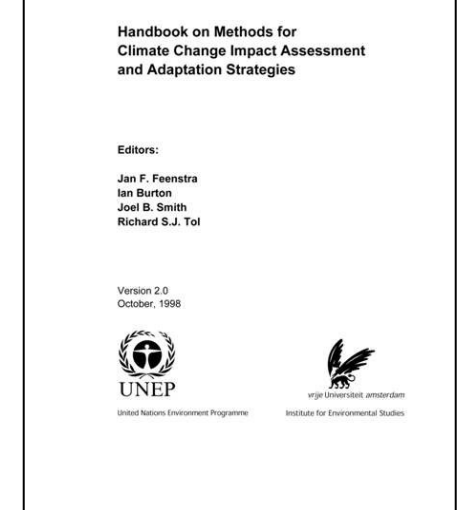
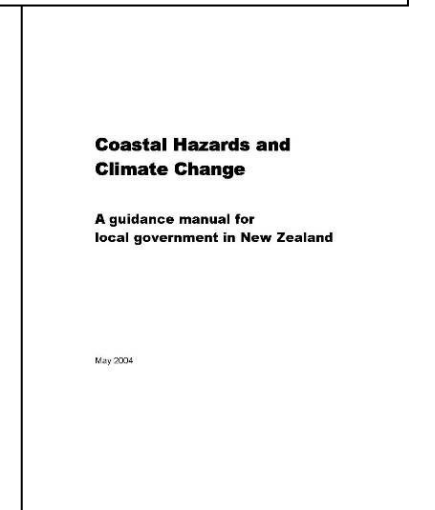
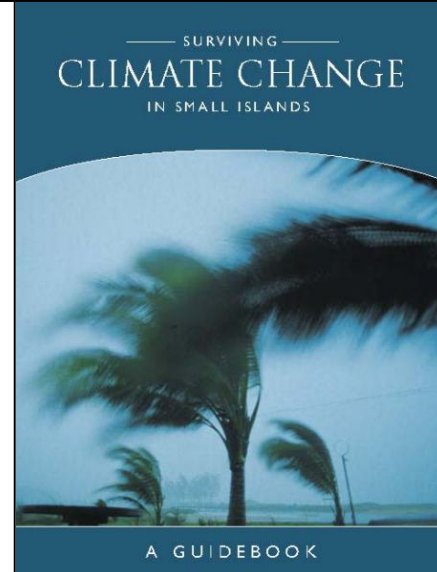
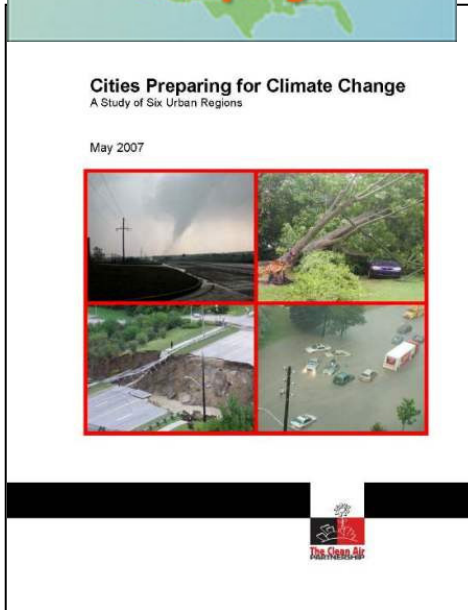
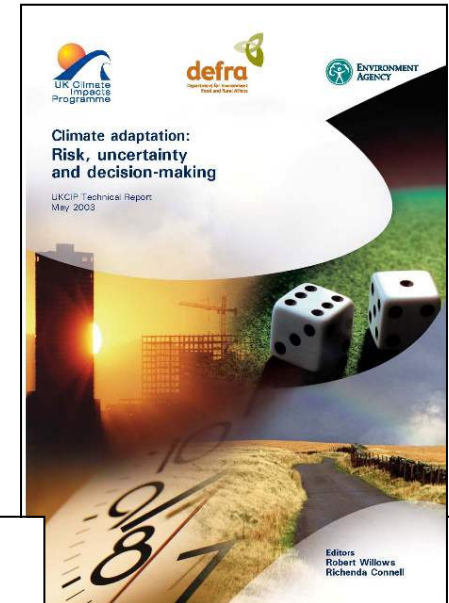
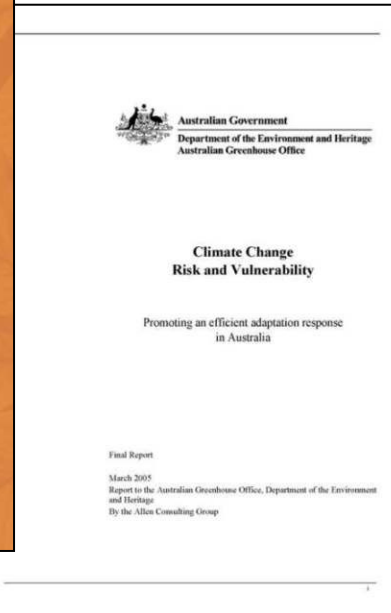
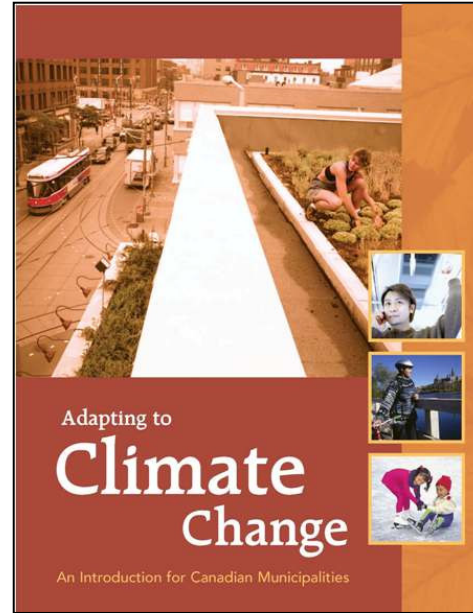
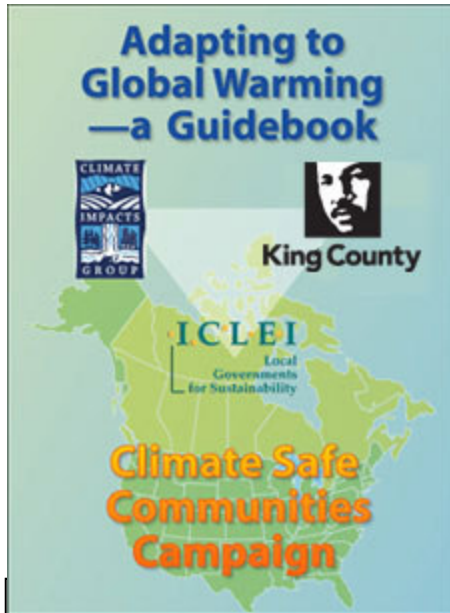
THE H. JOHN HEINZ III CENTER FOR SCIENCE,
ECONOMICS AND THE ENVIRONMENT



Assessment Approach: 8 Criteria

1. Useful to diff levels of gov't, environ. issues
2. Enough detail for policy development
3. Include a decision-making framework
4. Describe a method to assess sensitivity,
adaptive capacity, vulnerability
5. Include sample adaptive actions
6. Address implementation
7. Provide links to additional resources
8. Encourage stakeholder participation

Guidebooks and Frameworks



Comparison Criteria

								
<i>Applicable to different levels of government and types of environmental challenges</i>	✓✓	✓✓	✓	✓	✓	✓	✓✓	✓
<i>Sufficient detail for policy construction</i>	✓✓			✓	✓	✓	✓	
<i>Provides a decision-making framework</i>	✓	✓		✓	✓✓	✓✓	✓✓	✓✓
<i>Includes means to assess sensitivity, adaptive capacity, vulnerability</i>	✓		✓	✓	✓✓	✓✓		✓✓
<i>Suggests steps for adaptive actions</i>	✓✓	✓✓	✓✓	✓	✓	✓✓		✓✓
<i>Covers implementation</i>	✓	✓		✓✓		✓✓	✓	✓
<i>Provides links to additional resources</i>	✓✓		✓	✓✓		✓	✓✓	
<i>Includes stakeholders</i>	✓✓	✓✓	✓✓	✓✓	✓	✓	✓✓	✓

Legend:



discussed in depth



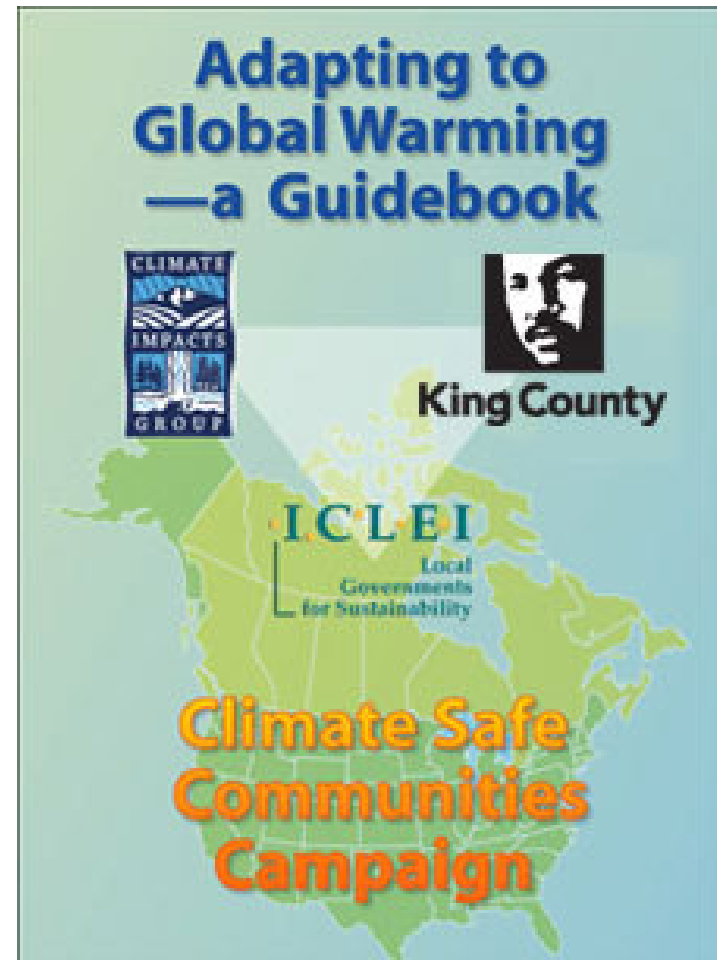
discussed in some detail

none -- very little detail or not discussed

ICLEI – King County - CIG

“Preparing for Climate Change: A Guidebook for Local, Regional and State Governments” (2007 projected)

- Local and regional governments
- Detailed “tactical” guidance
- Many additional resources





Clean Air Partnership

“Cities Preparing for Climate Change: A Study of Six Urban Regions” (2007)

- Case-study book
- Provides lessons learned
- Emphasizes:
 - Leadership
 - Stakeholders
 - Resources

Cities Preparing for Climate Change A Study of Six Urban Regions

May 2007

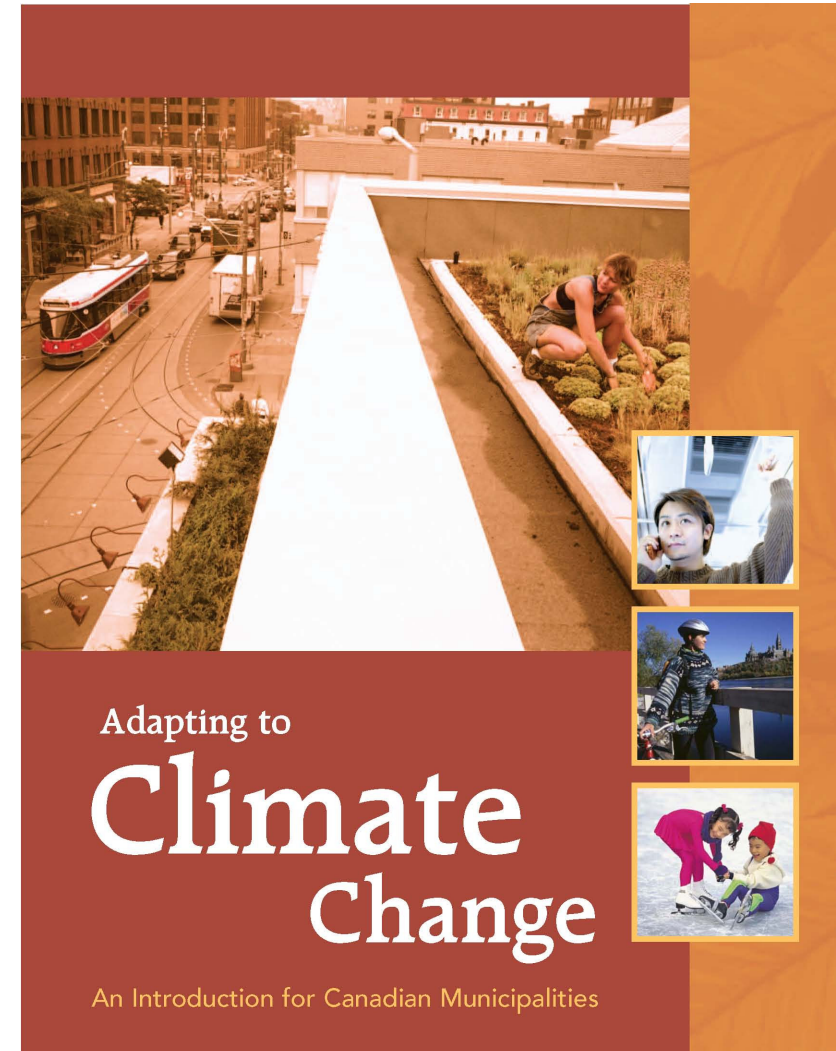




C-CIARN

“Adapting to Climate Change:
An Introduction for Canadian Municipalities” (2006)

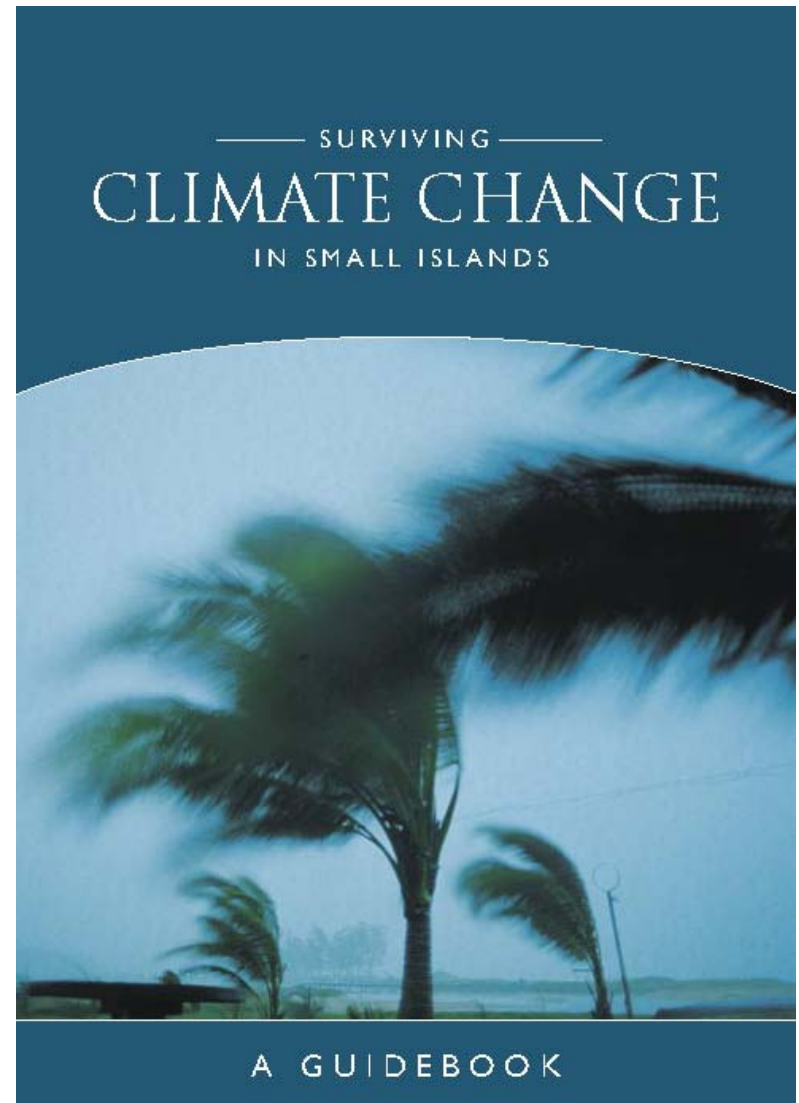
- Introduction
- 6 case studies of adaptation planning
 - Toronto’s Heat Alert System



Tyndall Centre

“Surviving Climate Change on Small Islands: A Guidebook” (2005)

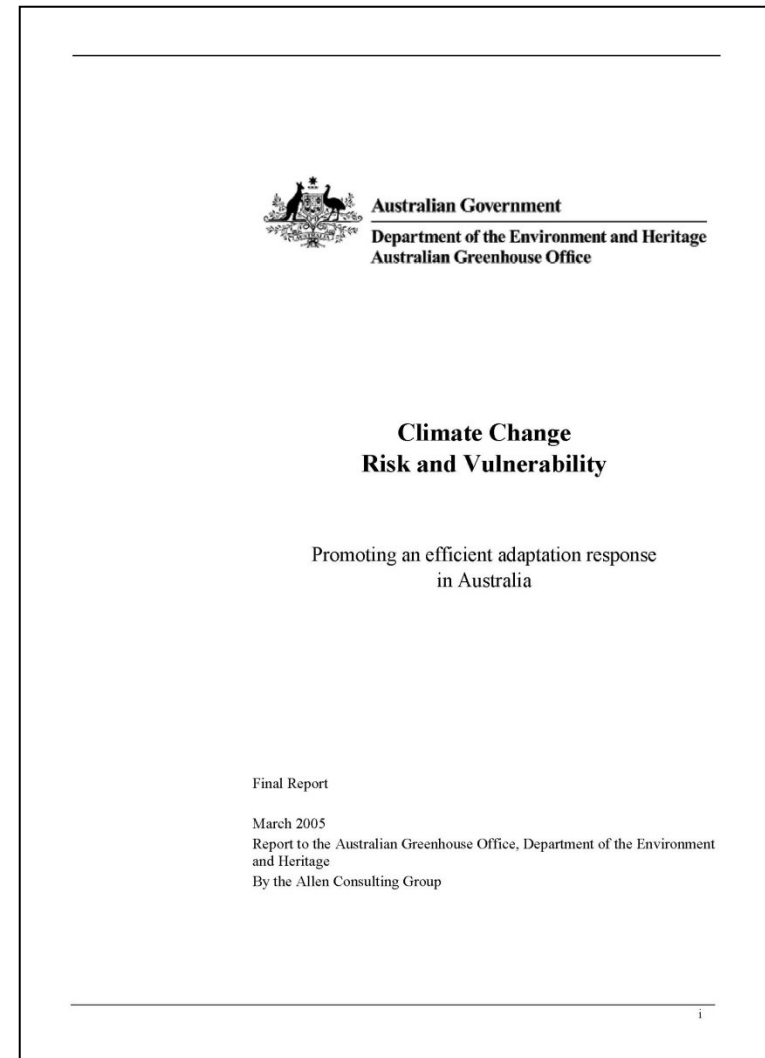
- Broadly applicable
- Detailed
implementation
- Extremely useful



Australian Greenhouse Office

“Climate Change Risk and Vulnerability: Promoting an Efficient Adaptation Response in Australia” (2005)

- Vulnerability assessment framework
- Decision-making techniques



Additional Guidebook

“Planning for Climate Change: A Handbook
for City, Town and Rural Area Planners”

by Scott Shuford



UNC Asheville

Collaboration Initiatives



Climate Resilient Communities

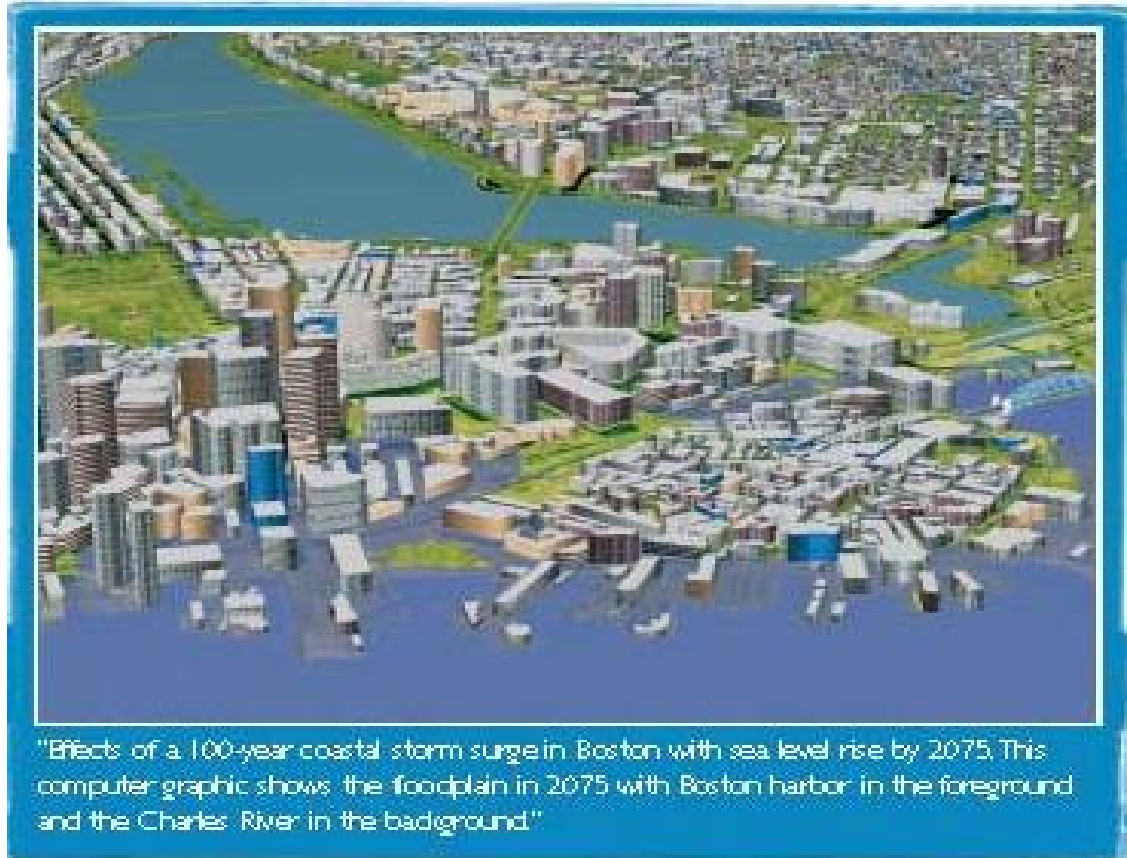


Urban Leaders
Adaptation Initiative

Boston

Deer Island Wastewater treatment plant:
Built 1990s higher elevation, higher cost to accommodate rising sea levels.

Other issues: bridge scour, energy demand, public health, flooding, buildings, water quality, water supply, transportation.



Source: Heinz Center report: A survey of Climate Change Adaptation Planning

Image Source: "Climate's Long-Term Impacts on Metro Boston (CLIMB)" (2004)

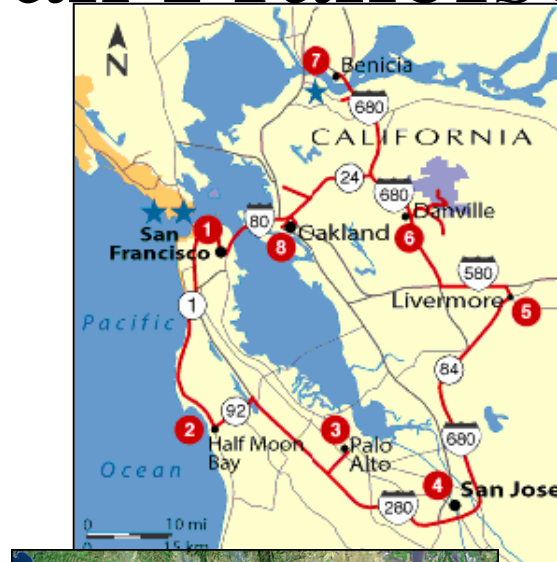
San Francisco Bay

Impacts of climate change on fresh water inflow

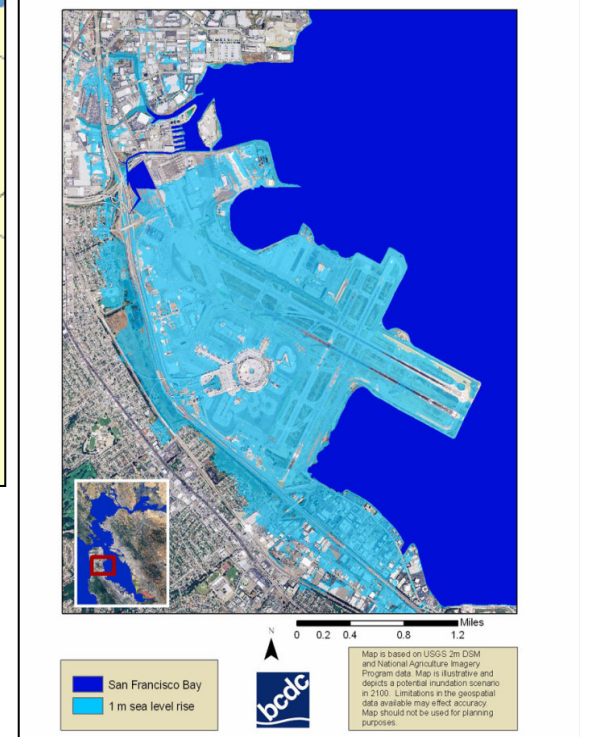
Other issues: flooding, sea level rise, extreme weather events

SLR maps-> 200 sq mi inundate \$100 billion

Impact studies and partnerships w/agencies



San Francisco Bay Scenarios for Sea Level Rise
SFO



Source: Heinz Center report: A survey of Climate Change Adaptation Planning

Image Source: San Francisco Bay Conservation and Development Commission

Chicago

- Stage: preliminary
- Impacts:
 - Aviation
 - Buildings
 - Energy demand
 - Lake level decrease
 - Public health
 - Transportation
 - Water supply



Homer, AK

- Stage: preliminary
- Impacts:
 - Extreme weather events
 - Ocean acidification
 - Sea-level rise
 - Warming oceans
 - Water supply
 - Wildfire risks



King County, WA

- Stage: complete
- Impacts:
 - Biodiversity and ecosystems
 - Buildings
 - Climate science
 - Economic impacts
 - Land use
 - Public health
 - Safety and emergency preparedness
 - Surface water management
 - Transportation
 - Water quality
 - Water supply



Miami-Dade County

- Stage: preliminary
- Impacts:
 - Agriculture and fisheries
 - Flooding
 - Loss of tourism
 - Public health
 - Sea-level rise
 - Temperature increases
 - Water supply
 - Wetlands



New York City

- Stage: sustainability plan
- Impacts:
 - Air quality
 - Flooding
 - Heat islands
 - Temperature increases
 - Sea-level rise

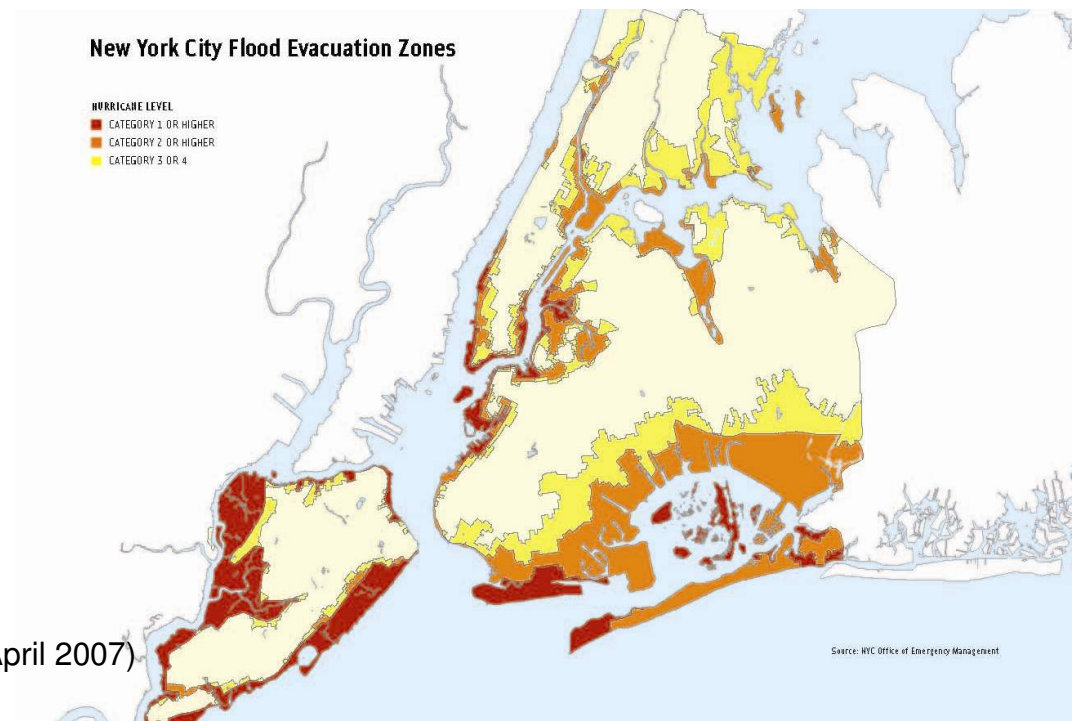
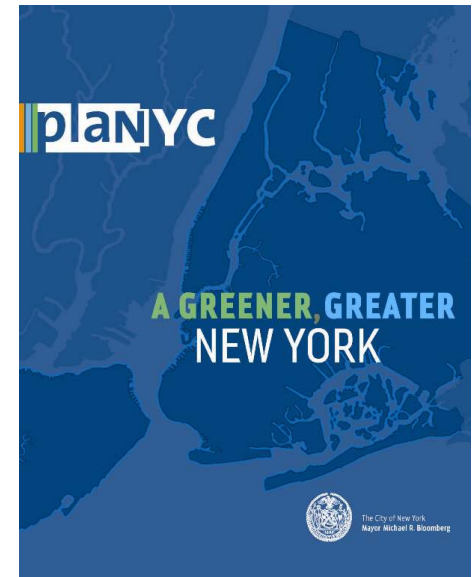


Image Source: "PlaNYC: A Greener, Greater New York" (April 2007)

Part 4

Define Adaptation and why it is important to consider

Ideas on where and how to incorporate climate change info into planning

Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/
Heinz Center Pilot project

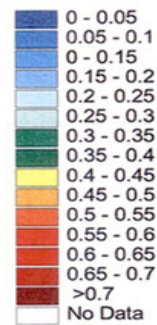
Developing Tools

1. Index of impacts & options
 - * Searchable list of issues: back of survey
 - * Will be built upon by AN
2. Downscaling of GCM data
3. Decision Support Cascade: pilots

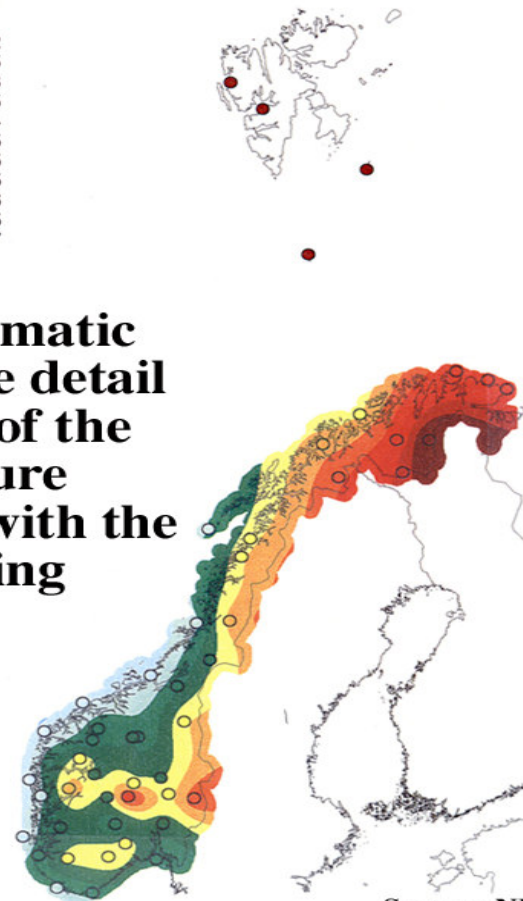
Norway Temperatures depicted in GCM for 2075



Increases in Temperatures per decade from a 1964-1990 base to 2020-2049



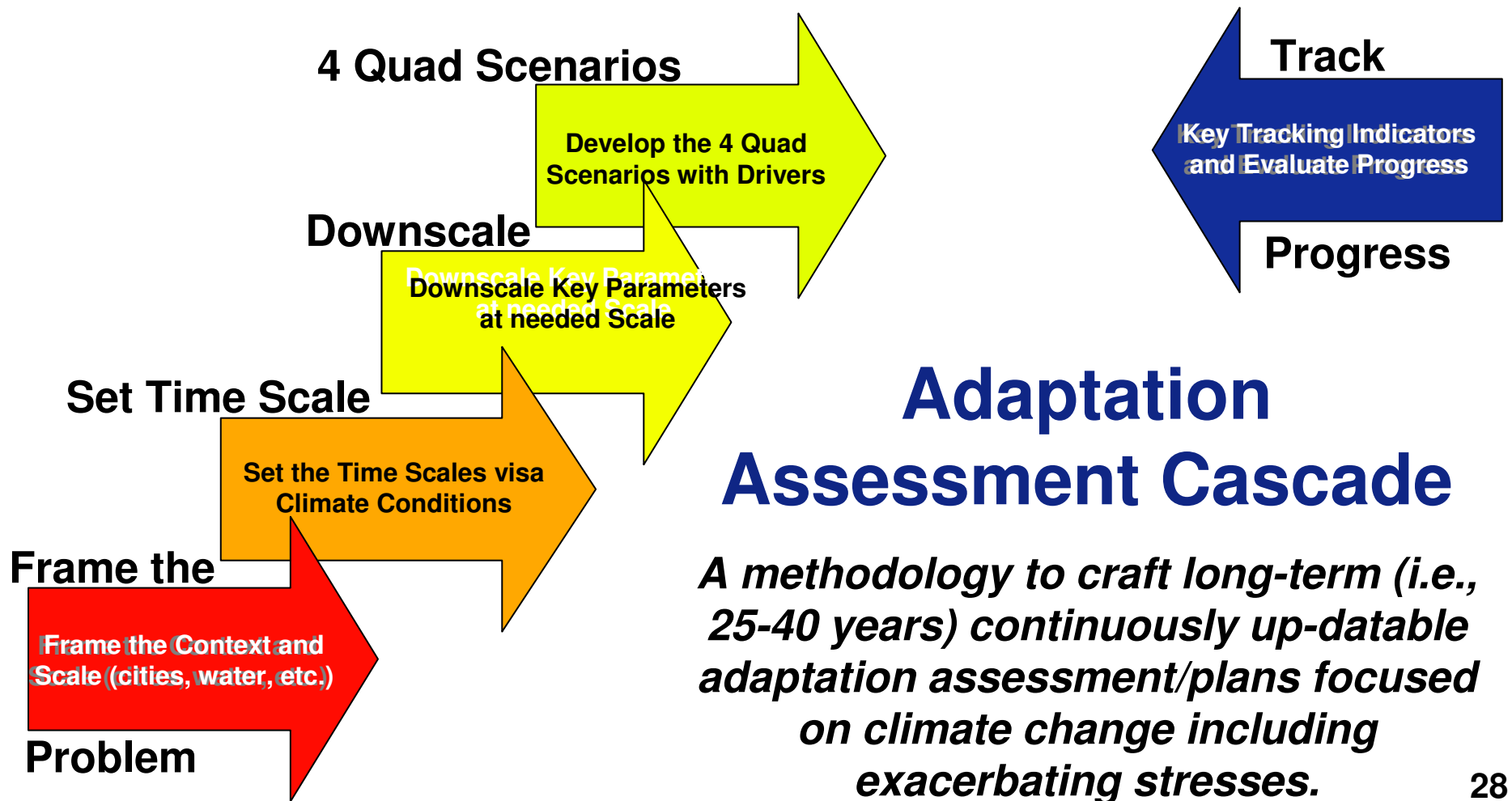
Note the dramatic increase in the detail and texture of the temperature distributions with the downscaling



Downscaled Image

Source: NMI

Develop a 25-40 year Adaptation Plan



Processes Respond Rapidly

“Lots” of Luck Scenario

1. Scenario Details
- 2.
- 3.
-
- n

“Get with it” Scenario

1. Scenario Details
- 2.
- 3.
-
- n

Weak to Little
Policy Action

Governance and

450
ppm

Policy Actions

Aggressive
Policy Action

Processes

Socio-Environment

“Well just Delay” Scenario

1. Scenario Details
- 2.
- 3.
-
- n

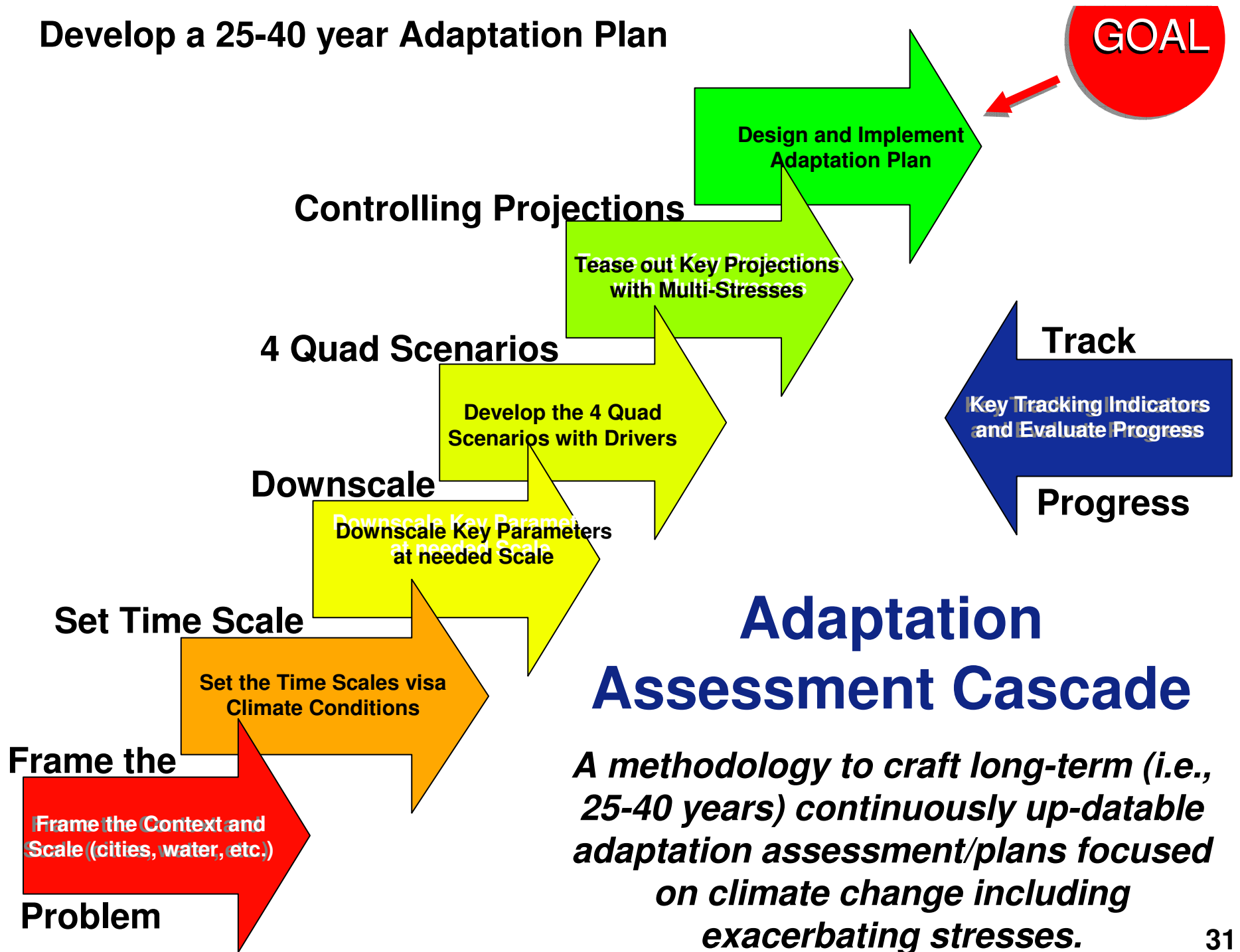
Easy Street Scenario

1. Scenario Details
- 2.
- 3.
-
- n

**4 Quad Scenario
Framework**

These Processes Respond very Slowly

Develop a 25-40 year Adaptation Plan



Adaptation Planning Pilot Study: 2008 Interested?

- Adaptation Network with the Heinz Center
- Working with downscaling information
- Cascade approach of multiple steps to move from impact assessment to adaptation plan implementation
- Contact: Lynne Carter, lcarter231@aol.com

Documents Available

Heinz Survey and King Co/ICLEI

adaptationnetwork.org

Adaptation: Planned or Reactive?

We can plan ahead

OR



We can react

Photos: courtesy of Joel Scheraga, EPA

Contact Info

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www.adaptationnetwork.org